Electronic health records: which practices have them, and how are clinicians using them?

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Abstract

Background Limited data exist to estimate the use of electronic health records (EHRs) in ambulatory care practices in the United States.
Methods We surveyed a stratified random sample of 1829 office practices in Massachusetts in 2005. The one-page survey measured use of health information technology, plans for EHR adoption and perceived barriers to adoption.
Results A total of 847 surveys were returned, for a response rate of 46%. Overall, 18% of office practices reported having an EHR. Primary-care-only and mixed practices reported similar adoption rates (23% and 25%, respectively, $P = 0.70$). The adoption rate in specialty practices (14%) was lower compared with both primary-care-only ($P < 0.01$) and mixed ($P < 0.05$) practices. The number of clinicians in the practice strongly correlated with EHR adoption ($P < 0.001$), with fewer small practices adopting EHRs. Among practices that have EHRs with laboratory and radiology result retrieval capabilities, at least 87% of practices report that a majority of their clinicians actively use these functionalities, while 74% of practices with electronic decision support report that the majority of clinicians actively use it. Among the practices without an EHR, 13% plan to implement one within the next 12 months, 24% within the next 1–2 years, 11% within the next 3–5 years, and 52% reported having no plans to implement an EHR in the foreseeable future. The most frequently reported barrier to implementation was lack of adequate funding (42%).
Conclusions Overall, fewer than 1 in 5 medical practices in Massachusetts have an EHR. Even among adopters, though, doctor usage of EHR functions varied considerably by functionality and across practices. Many clinicians are not actively using functionalities that are necessary to improve health care quality and patient safety. Furthermore, among practices that do not have EHRs, more than half have no plan for adoption. Inadequate funding remains an important barrier to EHR adoption in ambulatory care practices in the United States.

Introduction

Electronic health records (EHRs) have the potential to improve the quality and safety of health care and may reduce health care costs [1–3]. EHRs provide a longitudinal electronic record of patient encounters and patient health information, including patient demographics, progress notes, problems, medications, vital signs, medical history, immunizations, laboratory data and radiology reports [4]. Robust EHRs automate and streamline the clinician's workflow by allowing order entry for medications, laboratory tests and diagnostic procedures, and the highest-functioning EHRs provide clinicians with real-time evidence-based decision support and the potential for aggregating and reporting quality and outcome measures [5].

Despite the appeal of EHRs, available data suggest that the large majority of office practices in the United States, especially smaller offices, do not have this technology [6]. For example, using 2003 data from the National Ambulatory Medical Care Survey, Burt and Sisk reported that an average of 17.6 doctors used EHRs in their office-based practices [7]. In contrast, other countries, such as

Australia and the United Kingdom, are nearing universal adoption of EHRs. Michael Bainbridge, persenal communication [8].

To date, studies have focused on whether practices had EHRs, with limited attention towards the varying functions available within an EHR or the degree to which doctors are using those functionalities. To determine the current state of EHR adoption and the degree to which doctors with EHRs are using the functionalities of those systems, we conducted a survey of office practice managers in Massachusetts in 2005. We also assessed whether those practices that had not yet adopted EHRs anticipated adopting such systems, when if at all, and what barriers impeded their progress.

Methods

Sample

We used a 2005 office practice database from Folio Associates in Hyannis, Massachusetts, to identify all active medical and surgical practices in Massachusetts ($n = 6174$). We drew a stratified random sample of 1977 practices based on the following sampling strata:

Urban versus non-urban
Hospital-based versus non-hospital-based
Primary care versus specialty/mixed
Practice size (1, 2–3, 4–6, 7+ doctors)

We sampled 100% of hospital-based primary care practices, larger practices and non-urban practices to ensure their adequate representation in the sample. The first mailing of the office practice survey was addressed to the office practice manager at each practice site. Before the second mailing of the survey, a doctor was randomly chosen from each practice, and the survey was addressed to the office practice manager of the selected doctor.

During the course of the study, 148 practices were removed from the original sample: 144 practices had closed or the randomly selected doctor had left the practice, had retired or was deceased; one practice had been incorrectly categorized in the database; one practice did not see outpatients; and two practices had no patient care responsibilities. This process yielded a final sample size of 1829.

Survey questionnaire

We developed a one-page questionnaire targeted to office practice managers. Along with questions about practice demographics, the survey asked office managers to report on perceived barriers to EHR adoption and inquired about the use of computerized scheduling, billing, prescribing and EHRs. Office practice managers who reported having an EHR in their practice were asked to report on the presence or absence of 11 EHR functionalities and whether more than 50% of clinicians in the practice were actively using each of them. For practices that reported not having an EHR, the survey asked about future EHR implementation plans and perceived barriers to EHR adoption.

Survey administration

Atlantic Research and Consulting, Inc., a marketing research firm based in Boston, Massachusetts, administered the survey between March and August 2005. The initial survey was sent to 1977 practices in Massachusetts. A second mailing of the survey was mailed 1 month later. After the second mailing, non-responding practices were called two to six times and were offered the opportunity to complete the survey by telephone. A lottery incentive was offered to practices contacted by phone during the summer of 2005. Thirty per cent of responders completed the survey over the phone. Additionally, 6% of responders completed a faxed version of the survey. The Medical Group Management Association (MGMA) e-mailed a copy of the survey to all of its members in Massachusetts and Rhode Island. Five MGMA practices that overlapped with our statewide sample returned this e-mailed version of the survey.

Thirty-six practices from our sample were also participants in the Massachusetts eHealth Collaborative (http://www.MAeHC.org).

Statistical analysis

Sampling weights were applied to ensure that survey responses reflected the distribution of office practices in Massachusetts. Data were weighted by specialty, practice size, hospital affiliation and geography to make the sample representative of all Massachusetts practices. All results are presented in weighted form.

We used SAS software (version 9.1) for all statistical analyses [9]. Comparisons between survey respondents and non-respondents were made using adjusted Pearson chi-squared analysis. Whether or not a practice had an EHR was determined by the following question: 'Does your practice have an electronic medical record (EMR), an integrated clinical information system tracking patient health data and including visit notes, prescriptions, lab orders, etc.?' We used weighted chi-square tests for all analyses.

Results

Respondent characteristics

A total of 847 surveys were returned, for a response rate of 46%. Although responders and non-responders differed with respect to specialty, practice size, and hospital versus non-hospital base, all results were weighted so as to generalize to the entire Commonwealth of Massachusetts. Respondents and non-respondents were similar with respect to urban versus non-urban practice locations.

EHR adoption

Overall, 18% of office practices reported having an EHR. Primary-care-only practices and practices delivering both primary care and specialty care reported similar adoption rates (23% and 25%, respectively, $P = 0.70$). The adoption rate in specialty practices (14%) was lower compared with both primary-care-only ($P < 0.01$) and mixed ($P < 0.05$) practices. The number of clinicians in the practice strongly correlated with EHR adoption ($P < 0.001$), with fewer small practices adopting EHRs. Hospital-based practices (34%) were almost three times more likely than non-hospital-based practices (12%) to have EHRs ($P < 0.001$). Having either computerized claims and/or billing systems ($P < 0.01$), computerized scheduling systems ($P < 0.001$) or computerized prescribing systems ($P < 0.001$) was associated with

EHR adoption. Practice managers in both urban (18%) and non-urban (15%) practices reported similar rates of adoption ($P = 0.53$). Among the 18% of practices in Massachusetts with EHRs, 77% have implemented their systems within the past 6 years.

EHR functionalities

Visit notes (74%), lab test results (64%) and medication lists (64%) were the most commonly cited functionalities available within EHR systems (Fig. 1). The three functionalities cited as the least available were patient registry (48%), laboratory order entry (44%) and radiology order entry (40%). While radiology order entry was cited as the least available functionality in EHR systems, in 80% of practices where this functionality is available, more than 50% of clinicians are actively using it. Among practices that have EHRs with laboratory and radiology result retrieval capabilities, at least 87% of practices reported that the majority of their clinicians actively use these functionalities, while only 74% of practices with electronic decision support (alerts, warnings, reminders) reported that the majority of clinicians actively use it.

EHR implementation plans

Among practices without an EHR, the majority (52%) reported having no plans to implement one within the foreseeable future. A total of 13% plan to implement one within the next 12 months, 24% within the next 1–2 years, and 11% within the next 3–5 years.

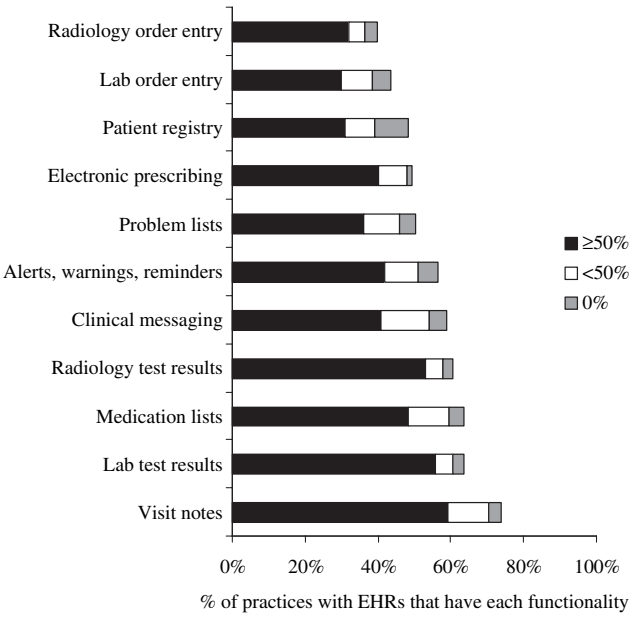

Figure 1 Availability and use of individual EHR functionalities among office practices with EHRs. The length of each bar indicates the percentage of practices that have each functionality available within their EHR system. The component segments of each bar reflect the proportion of practices in which 50% or more of the clinicians regularly use the functionality (black segment), less than 50% of the clinicians regularly use the functionality (white segment), and none of the clinicians use the functionality (grey segment). EHR, electronic health record.

Practice size was correlated with intention to adopt EHRs. Among solo practices, 70% had no plans to adopt in the foreseeable future, compared with 46% among practices with 2–3 doctors, 16% among practices with 4–6 doctors, and only 8% among practices with 7 or more doctors ($P < 0.001$). Specialty practices (59%) were more likely than primary care practices (43%) and mixed practices (32%) to report no plans for EHR implementation ($P < 0.001$).

Perceived barriers to EHR adoption

The most frequently reported barrier to implementation was lack of adequate funding (42%). Other barriers included: no physician support for change (28%); lack of technical knowledge or support (23%); would interfere too much with workflow (22%); and can't find EMR that fits our needs (20%). Reporting of each barrier varied by specialty and by practice size (Fig. 2), although no consistent trend was apparent.

Discussion

In Massachusetts in 2005, 18% of medical and surgical office practices reported using EHRs. Larger practices, practices that provided primary care, and those with other computerized systems were more likely to have adopted EHRs. Among practices with EHRs, most systems did not include advanced functionalities, such as order entry for medications, laboratory tests and diagnostic imaging. While 58% of practices with EHRs had electronic clinical decision support available, more than 1 in 4 practices indicated that a majority of their clinicians were not actively using that support. Among practices without EHRs, about half of practices (52%) have no plans for adoption in the foreseeable future; concerns about funding, inadequate technical knowledge and impact on workflow predominate.

The results of this survey amplify and expand on several recently published studies. Using data from the National Ambulatory Medical Care Survey, Burt and Sisk found that almost 18% of doctors use an EHR [7]. The 18% adoption rate in our study may not be directly comparable, because our denominator was practices (not doctors) and because our study used an explicit definition of an EHR based on the presence of specific functionalities. Gans and colleagues surveyed a sample of office practice managers from the membership of the MGMA and found that 14% of office practices had EHRs [6]. As in our study, Gans and colleagues found that EHR adoption varied by practice size and specialty.

Practice size appears to be one of the most important correlates of EHR adoption, with solo and small practices lagging behind larger practices. The relationship between adoption of other health information technology (HIT) (e.g. scheduling systems, electronic prescribing) and EHR adoption underscores the fact that larger practices with financial and technological resources and the ability to achieve economies of scale are generally the only segment of the population that has been able to invest in EHR systems.

Among practices with EHRs, the most frequently available functionalities were visit notes (i.e. charting) and data review (e.g. radiology and laboratory test results retrieval). While important in efforts to improve care and reduce errors, these functionalities alone may not lead to major enhancements to patient safety and

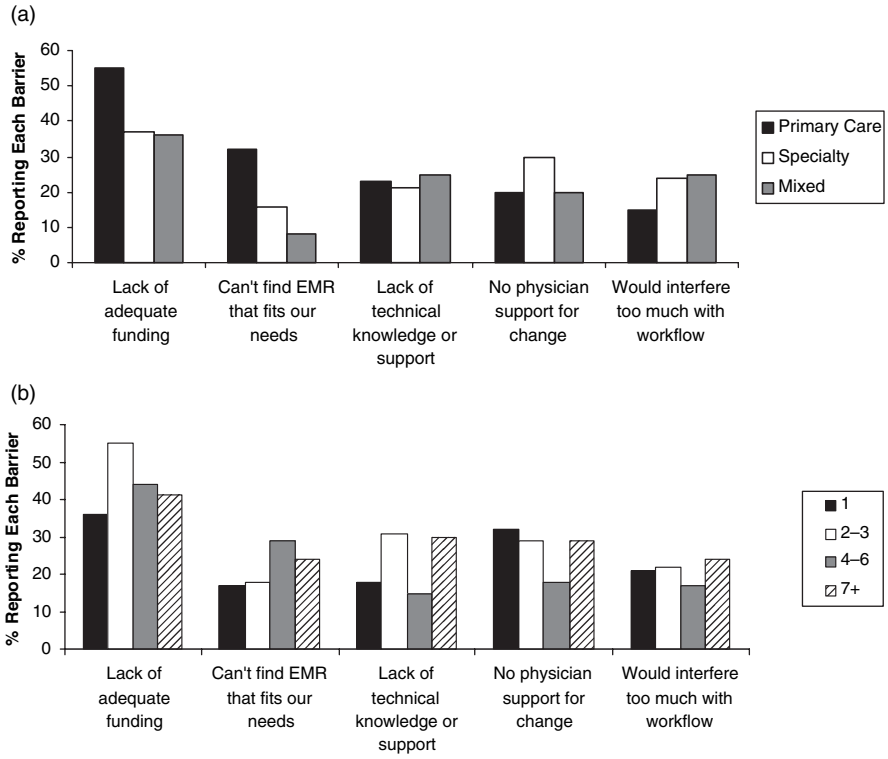

Figure 2 Barriers to EHR implementation among office practices that do not have EHRs. Panel (a) shows the reporting of barriers stratified by practice specialty, while panel (b) shows them by practice size (number of doctors in each practice). The height of each bar represents the percentage of practices that reported each barrier. EHR, electronic health record; EMR, electronic medical record.

health care quality. Furthermore, while more than two-thirds of practices indicated that a majority of their clinicians regularly use available functionalities, an important minority of practices – 20–25% for some functionalities – indicated that most of their doctors are not using these tools. Educational programmes and other practice support interventions may be needed to enhance the usage of key EHR functionalities to improve health care quality and patient safety.

The observations among practices that have not yet adopted EHRs were also quite striking. Despite widespread media attention and the federal government's establishment of HIT adoption as a priority, practices without EHRs seem, for the most part, likely to remain non-adopters. Policy changes, such as financial incentives for adoption of EHRs and other HIT, would begin to address the most commonly reported barriers. In addition, educational outreach interventions to support doctors and their staff in the EHR implementation process may help practices to overcome perceived inadequate doctor support for change and concerns about the lack of technical knowledge and about the potential effects of EHRs on workflow. These and other approaches must be tried and evaluated to move practices towards universal EHR adoption.

Our study has several limitations. The principal limitation is the 46% response rate and the observation that respondents and non-respondents differed on several demographic measures. Low response rates are typical, though, of surveys of medical office practices [6] and raise the possibility of non-response bias. Such non-response bias could be expected to lower the estimated proportion of practices having EHRs, as practices without EHRs might have been less likely to participate in a survey about EHRs. Despite this concern, our results regarding availability and use of EHR functionalities among practices with EHRs, and the findings regarding plans for and barriers to adoption may be less likely to be influenced by non-response bias. Another limitation is that the study was conducted in a single state, Massachusetts, which is not representative of other states. However, our survey did encompass a broad range of practices representing urban and non-urban locations, small and large practices, and primary care and all medical and surgical office-based specialties. While the overall adoption rates may not be generalizable to other states, it is likely that the responses of practices without EHRs may represent the attitudes and intentions of practices elsewhere.

In summary, fewer than 1 in 5 office practices in Massachusetts has EHRs, and smaller practices with fewer resources tend not to have this technology. Of considerable concern is the observation that more than half of practices without EHRs have no plans in the foreseeable future to embark on EHR adoption. Future efforts to expand EHR adoption must take into account both the financial barriers and the concerns about inadequate technical knowledge, doctors' resistance to change, and potential effects on workflow. These efforts must be targeted to solo and small group practices.

Acknowledgements

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